NOISE AND VIBRATION

Testimony of Jim Buntin and Steve Baker

INTRODUCTION

The construction and operation of any power plant creates noise or unwanted sound. The character and loudness of this noise, the times of day or night that it is produced, and the proximity of the facility to sensitive receptors combine to determine whether the facility would meet applicable noise control laws and ordinances, and whether it would cause significant adverse environmental impacts. In some cases, vibration may be produced as a result of power plant construction practices, such as pile driving. The ground-borne energy of vibration has the potential to cause structural damage and annoyance.

The purpose of this analysis is to identify and examine the likely noise and vibration impacts from the construction and operation of the East Altamont Energy Center (EAEC) (01-AFC-4), and to recommend procedures to ensure that the resulting noise and vibration impacts would be adequately mitigated to comply with applicable laws, ordinances, regulations, and standards (LORS), and to ensure that noise impacts are less than significant. For an explanation of technical terms employed in this testimony, please refer to **Noise: Appendix A** immediately following this section.

LAWS, ORDINANCES, REGULATIONS AND STANDARDS

FEDERAL

Under the Occupational Safety and Health Act of 1970 (OSHA) (29 U.S.C. § 651 et seq.), the Department of Labor, Occupational Safety and Health Administration (OSHA) has adopted regulations (29 C.F.R. § 1910.95) designed to protect workers against the effects of occupational noise exposure. These regulations list permissible noise exposure levels as a function of the amount of time to which the worker is exposed (see **Noise: Appendix A, Table A4** immediately following this section). The regulations further specify a hearing conservation program that involves monitoring the noise to which workers are exposed, assuring that workers are made aware of the effects of overexposure to noise, and periodically testing the workers' hearing to detect any degradation.

There are no federal laws governing off-site (community) noise.

The Federal Transit Administration (FTA) has published guidelines for assessing the impacts of ground-borne vibration associated with construction of rail projects, which have been applied by other jurisdictions to other types of projects. The FTA-recommended vibration standards are expressed in terms of the "vibration level," which is calculated from the peak particle velocity measured from ground-borne vibration. The FTA measure of the threshold of perception is 65 VdB, which correlates to a peak particle velocity of about 0.002 inches per second (in/sec). The FTA measure of the

threshold of architectural damage for conventional sensitive structures is 100 VdB, which correlates to a peak particle velocity of about 0.2 in/sec.

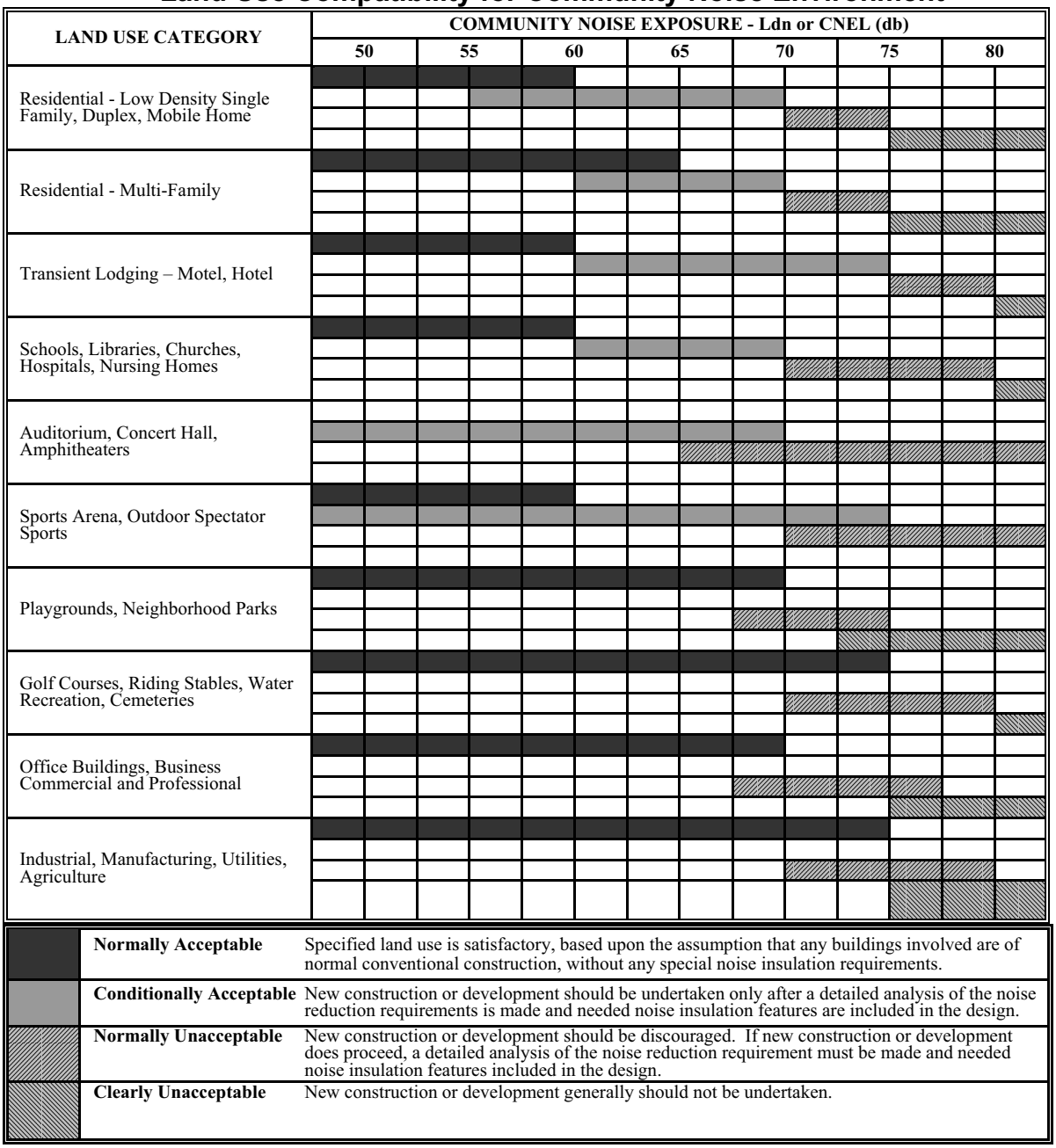
STATE

California Government Code Section 65302(f) encourages each local governmental entity to perform noise studies and implement a noise element as part of its General Plan. In addition, the California Office of Planning and Research has published guidelines for preparing noise elements, which include recommendations for evaluating the compatibility of various land uses as a function of community noise exposure. The State land use compatibility guidelines are listed in **Noise: Table 1**.

The State of California, Office of Noise Control, prepared a Model Community Noise Control Ordinance, which provides guidance for acceptable noise levels in the absence of local noise standards. The Model also contains a definition of a simple tone, or "pure tone," in terms of one-third octave band sound pressure levels that can be used to determine whether a noise source contains annoying tonal components. The Model Community Noise Control Ordinance further recommends that, when a pure tone is present, the applicable noise standard should be lowered (made more stringent) by 5 dBA.

Other State LORS include the California Environmental Quality Act (CEQA) and the California Occupational Safety and Health Administration (Cal-OSHA) regulations.

Noise: Table 1
Land Use Compatibility for Community Noise Environment



Source: State of California General Plan Guidelines, Office of Planning and Research, June 1990.

California Environmental Quality Act

CEQA requires that significant environmental impacts be identified, and that such impacts be eliminated or mitigated to the extent feasible. Section XI of Appendix G of CEQA Guidelines (Cal. Code Regs., tit. 14, App. G) sets forth some characteristics that may signify a potentially significant impact. Specifically, a significant effect from noise may exist if a project would result in:

a) exposure of persons to, or generation of, noise levels in excess of standards established in the local General Plan or noise ordinance, or applicable standards of other agencies;

b) exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels;

c) a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project; or

d) a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project.

The Energy Commission staff, in applying item c) above to the analysis of this and other projects, has concluded that a potential for a significant noise impact exists where the noise of the project plus the background exceeds the background by 5 dBA L_{90} or more at the nearest sensitive receptor.

Staff considers it reasonable to assume that an increase in background noise levels up to 5 dBA in a rural setting is insignificant; an increase of more than 10 dBA is clearly significant. An increase between 5 and 10 dBA should be considered adverse, but may be either significant or insignificant, depending on the particular circumstances of a case.

Factors to be considered in determining the significance of an adverse impact as defined above include:

1. the resulting noise level[1];
2. the duration and frequency of the noise;
3. the number of people affected;
4. the land use designation of the affected receptor sites;
5. public concern; and
6. prior CEQA determinations by other agencies specific to the project.

Noise due to construction activities is usually considered to be insignificant in terms of CEQA compliance if:

7. the construction activity is temporary;
8. use of heavy equipment and noisy activities is limited to daytime hours; and
9. all industry-standard noise abatement measures are implemented for noise-producing equipment.

[1] For example, a noise level of 40 dBA would be considered quiet in many locations. A noise limit of 40 dBA would be consistent with the recommendations of the California Model Community Noise Control Ordinance for rural environments, and with the data supporting the noise guidelines of the World Health Organization. If the project would create an increase in ambient noise no greater than 10 dBA at nearby sensitive receptors, and the resulting noise level would be 40 dBA or less, the project noise level would likely be insignificant.

Cal-OSHA

Cal-OSHA has promulgated Occupational Noise Exposure Regulations (Cal. Code Regs., tit. 8, §§ 5095-5099) that set employee noise exposure limits. These standards are equivalent to the federal OSHA standards (**see Noise: Appendix A, Table A4**).

LOCAL

Alameda County General Plan Noise Element

The Noise Element of the Alameda County General Plan contains provisions and policies that are intended to minimize noise impacts to the community. The Noise Element refers to an exterior CNEL of 60 dB as being acceptable in residential areas without additional sound insulation.

Alameda County General Ordinance Code

Alameda County has adopted specific noise standards for stationary sources in Title 6, Chapter 6.60 of the General Ordinance Code. The noise levels considered acceptable for any single- or multi-family residential, school, hospital, church, public library or commercial properties are described by **Noise: Table 2**.

Noise: Table 2
Alameda County Noise Standards

Noise Level Descriptor	Daytime Standard, dBA (7 a.m. to 10 p.m.)	Nighttime Standard, dBA (10 p.m. to 7 a.m.)
Median Level (L50)	50	45
Maximum Level	70	65

Each of the above standards is reduced by 5 dBA when applied to simple tone noise, noise consisting primarily of music or speech, or recurring impulsive noise.

Construction noise is exempt from the above noise standards between the hours of 7:00 a.m. to 7:00 p.m. on weekdays, and 8:00 a.m. to 5:00 p.m. on weekends.

Alameda County East County Area Plan Policies

Policies 265, 266 and 267 of the Alameda County East County Area Plan require the County to endeavor to maintain acceptable noise levels throughout the eastern part of the county. A noise level of 60 dBA is considered acceptable. The policies also require an acoustical analysis for a project that may result in noise effects.

Contra Costa County General Plan Noise Element

The Noise Element of the Contra Costa County General Plan contains provisions and policies that are intended to minimize noise impacts to the community. The Noise Element exterior noise standard for residential areas is 60 dB DNL.

San Joaquin County Code

Section 9-1025.9 (b) (1) of the San Joaquin County Code regulates noise from stationary sources. The noise standards that apply to steady-state stationary sources affecting noise sensitive uses are the same as in **Noise: Table 2**, though expressed in terms of the L_{eq}.

Section 9-1025.9 (c) (3) of the San Joaquin County Code exempts construction noise from County noise standards during the hours of 6:00 a.m. to 9:00 p.m. Section 9-1025.9 (c) (7) exempts noise associated with modifications of private and public utilities for maintenance or modifications to their facilities.

SETTING

PROJECT BACKGROUND

The East Altamont Energy Center (EAEC) project involves the construction and operation of a 1,100-megawatt (MW) power plant, which is proposed to be located on agricultural land at the northeastern edge of Alameda County.

The new units will consist of three natural gas combustion turbines with heat recovery steam generators and duct burners, and a condensing steam turbine. The EAEC will have a 230 kV switchyard, and will connect to the Western Area Power Administration (Western) substation using two new 0.5 mile-long 230 kV transmission lines.

The equipment that has the greatest potential to generate significant noise levels includes the gas turbines, steam turbine generator, duct burners, the auxiliary boiler, pumps, motors, main transformers, and a 19-cell mechanical draft evaporative cooling tower. During construction of the project, pile driving, if employed, would have the potential to produce significant ground-borne vibration levels.

Power Plant Site

This site is located within Alameda County, adjacent to San Joaquin and Contra Costa Counties. Land uses in the project vicinity include agricultural, industrial and school uses.

The EAEC will be constructed on currently vacant agricultural land. The nearest noise sensitive uses are homes on nearby agricultural parcels, the Livermore Yacht Club, and a school, all located at distances 0.5 miles or more from the project site. The Mountain House residential area, currently under development, is significantly farther away from the proposed project than the above receptors.

Linear Facilities

The EAEC will connect with the electrical grid at a new switchyard located on the plant site. Approximately 0.5 miles of two new double-circuit 230 kV transmission lines will connect the new switchyard to an existing 230 kV double-circuit transmission line that will be sectionalized to provide interconnections with Western's Tracy Substation and Westley Substation. The new lines will be installed over agricultural land and Kelso and Mountain House Roads.

The project will include construction of approximately 1.8 miles of new natural gas supply line, 4.6 miles of new recycled water supply line, and 2.1 miles of new water supply line. These facilities will be located primarily on agricultural lands, but may pass

in close proximity to houses. The natural gas and recycled water lines will be constructed in part on lands within the adjoining counties.

EXISTING NOISE LEVELS

In order to predict the likely noise effects of the project on adjacent sensitive receptors, the applicant commissioned ambient noise surveys of the area. The surveys were conducted in January and October of 2001. The noise surveys were conducted using Bruel & Kjaer sound level meters meeting the requirements of the American National Standards Institute (ANSI) for Type 1 sound level measurement systems. The measurements were performed at heights of approximately five feet above ground level to simulate the average height of the human ear (EAEC 2001, AFC § 8.5-5, EAEC 2001b).

The applicant's noise survey monitored existing noise levels at the following four off-site monitoring locations, which are shown by **Noise: Figure 1**:

1. Nearest existing residence (Franco), SE of project site, on Kelso Road
2. Nearest residence NE of project site, on Lindeman Road
3. First residence south of Kelso Road on Mountain House Road (The applicant stated in the AFC that this location is also representative of the nearby school site.)
4. A location adjacent to residences at Livermore Yacht Club

Noise: Table 3 summarizes the ambient noise measurement results at the above-listed monitoring locations (EAEC 2001, AFC § 8.5.2.2, EAEC 2001b).

NOISE Table 3
Summary of Measured Noise Levels

Measurement Sites	Measured Noise Levels, dBA			
	Average During Daytime Hours	Average During Quietest Nighttime Hours		CNEL
	L_{eq}	L_{eq}	L_{90}	
1 (January 2001)	55.0	45.9	31	57
1 (October 2001)	47.8	42.1	34	59*
2 (January 2001)	52.3	44.6	30	57
2 (October 2001)	51.5	48.6	39	56*
3**	66	39.4	30 - 32	55 - 60*
4 **	58	38.4	32 - 33	55 – 60*
* - Energy Commission staff calculation or estimate * * - Derived from 10-minute samples				

The noise environment in the immediate vicinity of the project site is dominated by noise from the wind, distant traffic, and agricultural activities.

In the Air Quality section of the AFC, the applicant notes that there is a consistent high-speed wind pattern in the project area, where the wind speeds exceed 3.7 meters per second (m/s) (8.3 mph) 58% of the time. The wind direction is predominantly from the

west-southwest and west. It is further noted that this condition occurs mostly during the spring, summer and fall. In winter, when the ambient noise monitoring was conducted for this project, wind speeds are lower, and the wind direction is from the east. The applicant provided data (EAEC 2001b) indicating that the high-speed wind pattern occurs during daytime hours.

High-speed wind conditions can affect noise in two ways: Ambient noise levels may increase due to wind interaction with vegetation and structures, and project-related sound may be propagated downwind.

The noise level measurements conducted in October 2001 were intended to address the potential for wind to affect background noise levels, and included the effects of wind speeds between 1 mile per hour at nighttime and above 10 miles per hour during the late afternoons. The measured background noise levels (L_{90}) in October were significantly higher than those measured in January, and exhibited more variability, probably as a result of the wind interaction with structures.

In general, the noise environment in the immediate vicinity of the existing plant can be described as relatively quiet, especially at night. During the spring, summer and fall, the prevailing wind may result in elevated noise levels. In the winter, when there is less wind, ambient noise levels are expected to be quite low. However, because people are more likely to be indoors with their windows closed, staff views winter noise levels as less critical than summer noise levels. Because residents are likely to open windows during the summer months, the summertime noise levels are used for judging potential noise impacts.

IMPACTS

Noise impacts associated with the project can be created by short-term construction activities, and by normal long-term operation of the power plant.

PROJECT SPECIFIC IMPACTS — CONSTRUCTION

Community Effects

General Construction Noise

Construction noise is usually considered a temporary phenomenon. In this case, the construction period for the EAEC would occur over a 2-year period. Construction of an industrial facility such as a power plant is typically noisier than permissible under usual noise ordinances. In order to allow the construction of new facilities, construction noise during certain hours is commonly exempt from enforcement by local ordinances. Alameda County regulates the permissible hours of construction, but does not have any specific noise limits during those hours.

The applicant has prepared an analysis of construction noise impacts, listing predicted noise levels due to specific types of equipment and to generalized construction activities. The construction noise analysis results are summarized for the most-affected receptor locations during the busiest periods of construction in **Noise: Table 4**.

Noise: Table 4
Construction Noise Level Predictions

Construction Phase	Predicted Average Noise Level, dBA	
	Site 1 Nearest home to SE: 2,700 feet away	Site 2 Nearest home to NE: 3,200 feet away
Site Clearing and Excavation	54	53
Pouring Concrete	43	42
Erecting Steel	52	51
Mechanical	52	51
Cleanup	54	53

The predicted construction sound levels would result in cumulative noise levels within the range of the daytime ambient noise level conditions at both of the above receptor locations. These increases would be perceptible during normally quiet hours, and would be of a temporary nature. The unmitigated increases in ambient noise levels due to construction are potentially significant. However, because construction will be restricted to daytime hours by Condition of Certification **NOISE-8**, the noise effect of construction is considered to be insignificant.

The noise levels shown in **Noise: Table 4** do not include the contribution of pile driving, as the applicant has indicated that pile driving may not be needed. If pile driving were needed, noise levels could be approximately 70 dBA at the nearest residence. This level would substantially exceed the range of daytime ambient noise levels in most cases, and is potentially significant. However, pile driving typically occurs over a relatively short period (a few days), and is of a temporary nature. Because construction will be restricted to daytime hours by Condition of Certification **NOISE-8**, the noise effect of pile driving, if it occurs, is expected to be insignificant.

Based upon the potential noise impacts of construction, the Energy Commission staff has recommended the inclusion of three Conditions of Certification (**NOISE-1**, **NOISE-2**, and **NOISE-8**) to monitor and mitigate potential construction noise impacts.

Because construction activity and related traffic are regulated by the proposed Conditions of Certification, and are of limited duration, potential construction noise impacts to receptors in the EAEC project area are considered to be less than significant.

Pile Driving Vibration

Conventional pile driving produces potentially significant ground-borne vibration at nearby receivers. In this case, the nearest potentially affected receptor is about 0.5 miles from the construction site, which is beyond the range over which pile driving vibration is expected to be potentially significant. Therefore, it is not expected that pile driving, if it occurs, will produce any significant vibration at the nearest receptors.

Steam Blows

Typically, the loudest noise encountered during construction, inherent in building any project incorporating a steam turbine, is created by the steam blows. After erection and assembly of the feed water and steam systems, the piping and tubing that comprises the steam path has accumulated dirt, rust, scale and construction debris such as weld spatter, dropped welding rods and the like. If the plant were started up without thoroughly cleaning out these systems, all this debris would find its way into the steam turbine, quickly destroying the machine.

In order to prevent this, before the steam system is connected to the turbine, the steam line is temporarily routed to the atmosphere. Traditionally, high pressure steam was then raised in the heat recovery steam generator (HRSG) or a temporary boiler and allowed to escape to the atmosphere through the steam piping. This flushing action, referred to as a steam blow, was quite effective at cleaning out the steam system. A series of short steam blows, lasting two or three minutes each, was performed several times daily over a period of two or three weeks. At the end of this procedure, the steam line was connected to the steam turbine, which was then ready for operation.

These high-pressure steam blows could produce noise as loud as 130 dBA at a distance of 100 feet. In order to reduce disturbance from steam blows, the steam blow piping could be equipped with a silencer that would reduce noise levels by 20 to 30 dBA, still an annoying noise level.

In recent years, a new, quieter steam blow process, variously referred to as QuietBlow™ or Silentsteam™, has become popular. This method utilizes lower pressure steam over a continuous period of 36 hours or so. Resulting noise levels reach only about 80 dBA at 100 feet; noise levels at nearby receptors are typically similar to the ambient background noise level, and thus barely noticeable. Even more recently, compressed air has been substituted for steam in the continuous blow process; resulting noise levels are similar.

According to the applicant, un-silenced high-pressure steam blow noise levels could be as high as 95 dBA at the nearest receiver (Site 1). With an appropriate silencer, such as a Fluid Kinetics Model TBS 16-AC, or similar, the noise levels could be reduced by 40 to 45 dBA, or to a level ranging from 50 to 55 dBA at the nearest residence (EAEC 2001a). Steam blow noise levels at the nearby school would be slightly lower than these values, as the school is about one-half mile farther away. The resulting noise levels would be in the range of ambient noise levels during daytime hours and thus would not result in a significant impact. The applicant has proposed to mitigate the noise generated from construction steam blows by use of a silencer similar to that described above.

In order to minimize annoyance due to steam or air blows, staff proposes Conditions of Certification to limit noise from steam blows by requiring the use of a temporary silencer to achieve the noise level cited above, and to implement a notification process to make neighbors aware of impending steam blows (see proposed Conditions of Certification **NOISE-4** and **NOISE-5** below). This should ensure that the noise from steam blows is within reasonable limits at the nearest residences.

Linear Facilities

New off-site linear facilities will include gas and water lines, and 230 kV transmission lines. Noise from these activities will be limited by adhering to the allowable hours of construction as cited in proposed Condition of Certification **NOISE-8**.

The applicant has indicated that horizontal drilling will be required for the new water line under the Delta-Mendota Canal, and that this activity would occur continuously over a period of about two weeks. The noise source associated with this activity would be the engine driving the drill rig. This noise source is potentially significant. The drill rig will be located on the opposite side of the canal relative to the potentially-affected residences. If the drill rig is fitted with adequate mufflers and the receptors are shielded from the noise from the drill rig by the canal banks as required by **NOISE-8**, the noise due to horizontal drilling will be less than significant.

Worker Effects

The applicant has acknowledged the need to protect construction workers from noise hazards, and has recognized those applicable LORS that would protect construction workers (EAEC 2001, AFC § 8.7). To ensure that construction workers are, in fact, adequately protected, Energy Commission staff has proposed Condition of Certification **NOISE-3**.

PROJECT SPECIFIC IMPACTS — OPERATION

Community Effects

The applicant has incorporated some industry-standard noise reduction measures into the design of the project. The applicant intends to achieve compliance with the noise performance standards of the Alameda County Community Noise Ordinance. Compliance with LORS, however, will not prevent a significant impact, since the allowable noise levels would be substantially higher than existing background noise levels.

Power Plant Operation

During its operating life, the EAEC would represent an essentially steady, continuous noise source day and night. Occasional brief increases in noise levels would occur as steam relief valves open to vent pressure, or during startup or shutdown as the plant transitions to and from steady-state operation. At other times, such as when the plant is shut down for lack of dispatch or for maintenance, noise levels would decrease.

The primary noise sources anticipated from the facility include the combustion turbines, the auxiliary boiler, steam turbine generator, relief valves, circulating water pumps, cooling towers, and the brine concentrator compressor. The noise emitted by power plants during normal operations is generally broadband, steady state in nature. The resulting hourly average noise levels are typically dominated by the steady-state noise sources.

The applicant performed acoustical calculations to determine the facility noise emissions, and to develop noise mitigation measures. The calculations were based on typical manufacturer noise data for the major equipment planned for the facility (EAEC

2001a, AFC § 8.8.3.4). The modeling assumed that the units would be operated at full load. The modeling was performed as an iterative process to refine noise mitigation measures and requirements for equipment noise emission factors. Specific noise mitigation measures evaluated in the AFC included:

enclosing combustion turbines to meet 85 dBA at 3 feet

enclosing the steam turbine generator

silencers on relief valve stacks

designing major components to limit noise to 90 dBA or 85 dBA at 3 feet

locating the power block in central portion of site

locating cooling towers on north side of site

locating brine concentrator compressor inside waste water treatment facility

Noise: Table 5 lists the predicted project noise levels at the nearest receptors in terms of the background noise level (L_{90}). The October noise level measurement data were used to represent summer conditions. The predicted noise levels take into account the applicant's proposed standard noise abatement design measures listed above (EAEC 2002a).

Noise: Table 5
Summary of Predicted Operational Noise Levels

Receptor Sites	Nighttime L_{90}, dBA			
	Summer Ambient	Project	Cumulative	Change
1	34	45	45	+11
2	39	42	44	+5
3	30 – 32	43	43	+11 to +13
4	32 – 33	38	39	+6 to +7

Based upon the predicted noise levels at the nearest receptors, Energy Commission staff believes that the operation of the project, as proposed, will result in substantial increases in background noise levels at the nearest sensitive receptors. The worst-case conditions would typically occur during winter months, when winds may be subdued. During the majority of the year, the increases in nighttime noise levels would be less than in the winter, but would remain substantial. Therefore, the proposed project would result in a significant noise impact at the nearest residential land uses.

At Site 3, the plant noise level is predicted to be 43 dBA. It can be extrapolated from this that the plant noise level will be lower than 43 dBA at the school site, which is located south of Site 3. This noise level is within the range of existing daytime noise levels, and is not expected to result in speech or activity interference either inside or outside the school classrooms.

CEQA requires that noise impacts from a project be mitigated to a level of insignificance. In determining if a significant impact will likely occur, Energy Commission staff has traditionally followed the noise industry custom of assuming that a

project that increases the existing noise level at a sensitive receptor by 5 dBA or more holds the potential to produce a significant adverse impact, and that further study is warranted in such situations. (A change of five dBA is considered to represent an increase in noise that is noticeable, but not necessarily annoying, to a majority of receptors.) See **Noise: Appendix A** for additional descriptions of the effects of noise on people.

A power plant operates as essentially a steady, continuous noise source, unlike the relatively random intermittent sounds that normally comprise a noise environment. As such, power plant noise contributes to, and becomes part of, the background noise level, or the sound heard when most intermittent noises cease. When no traffic is driving by, no airplanes are flying overhead, no dogs are barking, no frogs are croaking, and no strong wind is blowing, what remains is background noise. This "background noise level" is commonly described by the L_{90} value, which is the noise level exceeded 90 percent of the time. In most cases, a power plant will operate around the clock, for most of the year. The plant will thus contribute to, and often define, the background noise level.

Nighttime ambient noise levels in rural areas are typically lower than the daytime levels; differences between day and night background noise levels of 5 to 10 dBA are common. Exceptions may occur when insects and frogs are active at night, and when winds blow far into the night. With this assumption, staff usually believes it both prudent and conservative to employ the lowest nighttime background noise level values as the relevant noise regime. To reflect the fact that noise levels vary naturally over the quietest periods, staff does not assume that a single hourly background noise level should be used as the standard of potential impact. Rather, it is usual to calculate the average L_{90} value for the quietest period of the night, typically a period of four hours or more.

Staff also considers the potential for annoyance by plant noise at night when residents are trying to sleep. It is common in rural areas (as in this case) to find that ambient noise levels are lower in winter months than in summer months. In summer, however, residents are more likely to sleep with windows open, exposing them to higher plant noise levels inside the house than in the winter months, when windows are typically closed. Thus there is a higher potential for plant noise to annoy people during the summer months.

In this case, ambient background noise levels during nighttime hours range from 27 dBA to 48 dBA, with the lowest noise levels attained during winter. The projected cumulative power plant noise levels, after including the proposed standard noise control measures listed above, are in the range of 38 dBA to 45 dBA, as cited in **Noise: Table 5**. If constructed as proposed, the project's noise level at the nearest sensitive receptors would represent an increase of up to 13 dBA over the nighttime ambient background noise levels. Such increases in background noise levels would be clearly noticeable, profoundly altering the noise regime in the project vicinity. Energy Commission staff considers such an increase in background noise level to be clearly significant.

The proposed Condition of Certification **NOISE-6** would require that the noise level produced by the plant operation not exceed 39 dBA L_{eq} at any residence. This would ensure that the cumulative nighttime background noise level (L_{90}) at any residential receptor would not increase by more than 8 dBA under summer weather conditions, and that noise due to the plant operations would not exceed the standards of the Alameda County Community Noise Ordinance (45 dBA nighttime) at any sensitive receptor. The resulting change in ambient noise levels of 8 dBA would be noticeable, but not necessarily annoying in and of itself. Based upon the applicant's noise level predictions, power plant noise levels would be lower than 39 dBA at all other receivers due to their greater distances from the project site.

Specifically, implementation of the proposed Condition of Certification **NOISE-6** would result in the noise levels shown in **Noise: Table 6**.

The applicant has reportedly obtained an option on the property described as the Franco residence, which is the residence nearest the project site (Site 1). Upon exercise of this option after licensing of the project, the residential structure would be removed from residential use for the life of the project. If the owner were to sell the parcel of land, the former residence would be demolished. **Noise: Table 6** was prepared with the assumption that the residence at Site 1 would no longer be used as a residence, and that the most-affected residence would be at Site 2. If the applicant were to fail to remove the residence at Site 1 from residential use, it would be necessary to achieve the noise standard at Site 1, and the predicted plant noise levels at Sites 2, 3 and 4 would be further reduced by about 1 dBA. Proposed Condition of Certification **NOISE-9** requires that the Franco residence be removed from residential use for the life of the project.

Noise: Table 6
Conditioned Plant Operational Noise Levels and Resulting Ambient Noise Levels

	Noise Level, dBA			
Site	4-Hour Background Noise Level	Permitted Plant Noise Level	Cumulative	Resulting Increase in Ambient Noise Levels
2	39	38*	42	+3
3	32	39	40	+8
4	33	34*	36	+3

* Adjusted for distance, based on applicant's unmitigated noise level predictions.

Energy Commission staff believes that achieving an operational noise limit of 39 dBA (and a cumulative noise level of 40 dBA) at any residence as required by **NOISE-6** will ensure that noise impacts will be less than significant.[2] Staff recognizes that the resulting cumulative noise levels would be considered quiet, and notes that the proposed noise limit is intended to ensure that the noise from the power plant would not

[2] When measuring an ambient noise level, noise descriptors such as L_{eq}, L_{50} and L_{90} are all useful measures. When measuring the noise from a specific source such as a power plant., L_{eq} is the appropriate measure. Combining the ambient background (L_{90}) noise level with project noise (L_{eq}) yields a noise level that can be expressed in terms of L_{eq} or, since the power plant's noise output is so constant, in terms of L_{90}, the new (cumulative) background level.

constitute an annoyance to a reasonable person accustomed to the pre-project noise environment. Application of an operational noise limit of 39 dBA is consistent with the recommendations of the California Model Community Noise Control Ordinance for rural environments, and the resulting cumulative noise levels are consistent with industrial noise standards commonly applied in European countries (Gottlob, 1995).

Other factors that were considered in reaching this conclusion were:

1. No unusual noise duration or frequency characteristics are predicted for the project.
2. There will be a relatively small number of people affected by plant noise.
3. The affected land use designations are agricultural.
4. There have been no specific concerns about the predicted plant noise levels expressed by the public or other government agencies.
5. There have been no contradictory prior CEQA determinations by other agencies specific to this project.

Staff's proposed project noise limit of 39 dBA at the nearest residence is 6 dB more stringent than the limit proposed by the applicant. The applicant stated in the AFC that it "does not believe that a noise mitigation package capable of reducing the project's cumulative noise impacts to below 40 dBA L_{90} is achievable" (EAEC 2001a, Response 78, page 43). Later, at the PSA workshop, the applicant indicated that a plant noise level of 43 to 44 dBA might be attainable.

However, the applicant provided no technical or feasibility data to support a determination that a lower level could not be attained. Staff believes, on the basis of Energy Commission experience with other power plants, that significant additional noise reduction can be achieved using a variety of measures, such as those listed below:

low-noise equipment such as pumps and electrical transformers

quieter gas turbine inlet air mufflers

noise attenuating vents on turbine generator enclosures

noise lagging on the HRSG transition ducts

low noise cooling fans for the cooling tower that incorporate additional fan blades or specially-designed "super low noise" fans combined with noise-reducing motor enclosures

The applicant has not stated whether such measures have been considered in the plant acoustical design, nor whether they are considered to be feasible. Staff notes that the above design features have been deemed technologically feasible for other power plant installations.

Data provided to staff for similar recent projects before the Energy Commission have shown that a noise level reduction of 8 to 10 dBA may be obtained by specifying acoustical cladding and barriers for steam turbine generators, and by specifying moderate improvements in exhaust silencers for HRSG units. Noise level reductions of up to 20 dBA have been reported for cooling towers by using super-low noise fans.

In response to staff data requests, the applicant reiterated that the project would include the standard noise control specifications listed earlier in this section. The applicant also stated that: "the most practical means of mitigating the above sources further and reducing overall plant noise levels at the receptors would be to employ external sound barriers or acoustically treated buildings." The applicant further stated that: "Such structures are normally very costly, significantly hinder maintenance activities, and can be very large, potentially impacting other project areas." These statements imply that further noise reduction would be impractical or too costly. Staff respectfully disagrees with this implication, noting that other power plant projects approved by the Energy Commission have incorporated practical and feasible noise mitigation measures, such as those listed above, which have resulted in lower noise levels than predicted for this project.

The applicant replied to staff's question concerning options in noise control for specific sources with a review of the noise level reduction possibilities (and costs) for cooling fans. Unfortunately, that analysis was flawed in the initial premise that cooling fans were a dominant noise source. Furthermore, the applicant's finding that the use of low noise cooling fans would yield only a 2.6 dBA reduction in source noise levels is inconsistent with data provided to staff concerning the Morro Bay power plant project, where low-noise fans reduced cooling tower noise by up to 20 dBA.

The remainder of the applicant's analysis, dealing with the net noise reduction for the power plant and the costs and efficiencies associated with the change of equipment specifications, is of the type that staff would expect the applicant to perform for the noise sources that most affect the sensitive receptors.

Alternative Noise Criteria

To illustrate the effects of the proposed noise limits, and to respond to the applicant's concern about the suitability of the L_{90} descriptor as a means of defining the threshold of potential significance, Energy Commission staff conducted additional ambient noise measurements at the home adjacent to the Mountain House School (Site 3). The measurements included hourly noise levels for two 24-hour periods, as well as one-second time histories for the hours of midnight to 6 a.m. on February 15, 2002. Representative data from this sample are shown by **Noise: Figure 2**. The ambient noise levels measured at this site were consistent with the "summer" ambient noise level data in **Noise: Table 3**, which were used to develop the noise limits proposed (**NOISE-6**) for this project.

Noise: Figure 2 illustrates the relationships between the actual noise levels measured during a typical quiet hour and the noise descriptors commonly used in environmental noise assessments (e.g., L_{eq}, L_{50} and L_{90}). In this example, the noise levels measured over each one-second period in the hour from 1:00 a.m. to 2:00 a.m. are shown; the levels vary in relation to the noise sources present in that environment. The figure shows the calculated average noise level (L_{eq}), median noise level (L_{50}), and background noise level (L_{90}) for that hour, as well as the Alameda County noise standard of 45 dBA, which is the limit proposed by the applicant.

During the hour described by **Noise: Figure 2**, the background noise level (L_{90}) was calculated to be 34 dBA. An increase of 5 dBA due to introduction of a power plant noise source would yield a continuous background noise level of 39 dBA. It can be seen from **Noise: Figure 2** that the resulting noise level would be nearly equivalent to the ambient L_{eq} value, calculated to be 39.7 dBA in this example.

In this example, if the noise limit applied to the project were 39 dBA, the plant noise level would cover most background noise sources (such as distant traffic, wind, and animals), but would not completely mask them.

If the project were allowed to increase the noise level to 45 dBA at this location, as proposed by the applicant, the plant noise level would completely mask most background noise sources. Thus the change in background noise levels would be substantial, and clearly significant.

The applicant, in a Scheduling workshop, commented that land use compatibility is often judged by compliance with a noise limit in terms of the L_{dn} descriptor, and that L_{dn} should be used as the basis of a criterion for this project. Staff notes that the issue in this case is not land use compatibility *per se*, but whether the project will result in a significant noise impact due to changes in ambient noise levels. Although it is staff's opinion that use of the L_{dn} descriptor is inappropriate and unnecessary, the following discussion illustrates the possible results of using an L_{dn}-based criterion for this project.

L_{dn} is a cumulative metric, averaging the noise exposure over the entire 24-hour day after applying a 10-dBA penalty to nighttime noise levels. The L_{dn} descriptor was originally developed by the U.S. Environmental Protection Agency (EPA) to address the potential effects of noise on public health and welfare. It has traditionally been applied to assessment of noise due to transportation sources, such as aircraft (at airports), railroad line operations, and highway traffic. The purpose of the 10-dBA nighttime penalty is to account for the potential interference of noise with sleep during nighttime hours.

In this case, the power plant noise is expected to affect nighttime noise exposures, so including daytime noise exposures in the calculations is an unnecessary complication. Since the L_{dn} metric averages noise levels over the day and night hours, it is not ideally suited to assessing noise effects during nighttime only.

In addition, the established L_{dn} criteria for land use compatibility were not intended to address the issue of changes in ambient noise levels. Instead, they were developed to address annoyance.

In 1992, the Federal Interagency Committee on Noise (FICON) recommended that annoyance be used as a summary measure of the general adverse reaction of people to noise. FICON further recommended that L_{dn} values be related to the percentage of persons "highly annoyed," using a standard equation called the "Schultz Curve."

FICON recommended a land use compatibility criterion for airports of 65 dB L_{dn}. This level would result in about 13% of the population being "highly annoyed." ("Highly

annoyed" means that a person is concerned enough to identify noise as a negative factor in his or her personal environment.)

The U.S. EPA determined in 1974 that the "level of environmental noise requisite to protect the public health with an adequate margin of safety" (primarily from the standpoints of hearing protection and activity interference) is 55 dB L_{dn}. This level would result in about 4% of the population being "highly annoyed."

For a continuous noise source, the L_{dn} will be approximately 6 dB higher than the average hourly noise level (L_{eq}). The EPA-recommended level of 55 dB L_{dn} is equivalent to a continuous noise level of 49 dBA. In this case, that L_{eq} value would be about 15 dBA above the ambient background noise levels in the quietest hours of the night. This would clearly be a significant change.

Given that the L_{dn} descriptor was not intended to address noise effects limited to certain hours, and that it was not intended to address changes in ambient noise levels, staff does not believe that noise limits in terms of the L_{dn} are appropriate for power plants.

Applicant's Proposed Mitigation

The applicant has reportedly obtained an option on the property described as the Franco residence, which is the residence nearest the project site (Site 1). Upon exercise of this option after licensing of the project, the residential structure would be removed from residential use for the life of the project. If the owner were to sell the parcel of land, the former residence would be demolished.

The applicant has also offered to provide additional sound attenuation at receptors where post-project noise levels would exceed ambient noise levels by 5 dBA, and where residents complain of disturbance from increased noise due to the EAEC. The specific attenuation measures would be case-specific, and would include replacement of existing windows with dual-pane windows, replacement of hollow-core exterior doors with solid-core doors, air conditioning, and additional insulation in walls. These treatments could be expected to reduce interior noise levels by about 5 dBA. The applicant has transmitted the sound attenuation offers to the three nearest residents (excepting the Franco family), but has provided no indication to date that the residents are willing to accept the proposed measures.

Staff's concerns about applying such mitigation without first applying all feasible mitigation to the noise source (the power plant) are that: 1. implementation of the additional sound attenuation would not mitigate exterior noise levels, but would only serve as an enhancement of the acoustical environment inside the homes; and 2. there is no certainty that all affected residents will ultimately accept, and be satisfied with, the offered mitigation. Were that not to occur, then the mitigation upon which the Commission's decision was based would not occur. Note that staff believes that retrofitting the power plant itself after construction, to reduce noise impacts, may not be feasible. Retrofitting the sort of noise mitigation features suggested above by staff would be much more costly than incorporating them in the initial design of the project.

On September 3, 2002, the applicant docketed a revised response to staff's Data Request 78 (EAEC 2002ppp). In brief, the revised response:

1. misinterprets staff's proposed Condition of Certification **NOISE-6**, which allows a project noise level of 39 dBA, combined with the ambient background noise level of 32 dBA (at monitoring site 3), to produce a cumulative level of 40 dBA. The applicant claims that the project alone should be allowed to produce 40 dBA at site 3;
2. shows, without explanation, in Table 78-1 ambient background (L_{90}) noise levels at monitoring sites 3 and 4 that are from three to six dBA greater than previously measured; and
3. estimates the capital and operating costs of applying noise mitigation to the project. Staff notes that the applicant still does not claim that adding such mitigation measures would be infeasible or cause them to abandon the project.

Tonal and Intermittent Noises

One possible source of annoyance would be strong tonal noises. Tonal noises are individual sounds (such as pure tones) that, while not louder than permissible levels, stand out in sound quality. The applicant has stated that no strong tonal noises will be generated during the operation of the project.

The applicant has also stated that steam relief vents will be silenced to mitigate the intermittent noise from pressure relief valves. Although these noise sources are expected to be in compliance with the LORS, their noise effects may be significant in the context of the quiet ambient noise environment.

To ensure that no strong tonal noises are present and that intermittent noises are mitigated, Energy Commission staff has proposed a Condition of Certification (**NOISE-6**, below), which requires the applicant to mitigate pure tones and the noise from steam relief valves.

Linear Facilities

The electrical output of the plant will be connected to the existing 230 kV transmission line about 0.5 miles south of the project site (EAEC 2001a, AFC § 8.5.3.8). Noise from the transmission lines will include a corona discharge hum, which is expected to be audible within 100 feet of the power lines. The nearest residences are located more than 100 feet from the transmission lines. The proposed 230 kV switchyard will be located on the project site, and will be at least 0.5 miles from the nearest residence. As a result of the large setbacks of the linear facilities from residences, no noise impacts will occur from linear facilities.

Worker Effects

The applicant recognizes the need to protect plant operating and maintenance personnel from noise hazards, and has committed to comply with applicable LORS (EAEC 2001a, AFC § 8.7). Signs would be posted in areas of the plant with noise levels exceeding 85 dBA (the level that OSHA recognizes as a threat to workers' hearing), and hearing protection would be required. The applicant would implement a

comprehensive hearing conservation program. To ensure that construction workers are, in fact, adequately protected, Energy Commission staff has proposed Condition of Certification **NOISE-7**, below.

LORS COMPLIANCE

Alameda County has registered disagreement with staff's interpretation of the Alameda County Noise Ordinance. This Ordinance states that "It is unlawful to create any noise which causes the exterior noise level when measured to exceed the noise standards "These standards, for residential and school properties, are 50 dBA L_{50} during the daytime and 45 dBA L_{50} during the nighttime.

The Directors of the County Development Agency and Environmental Health Services Department disagreed with staff's interpretation. Their letter of December 17, 2001, stated that the noise standard of the Noise Ordinance "does not specify a standard for ambient cumulative noise levels but only for source-specific noise."

Staff respectfully disagrees. The language of the Ordinance, quoted above, refers to the total, or cumulative, noise due to the project superimposed on the ambient noise level: "…any noise which causes the exterior noise level to exceed the noise standards." The project noise, added to the existing (ambient) noise level, could cause the (cumulative) exterior noise level to exceed the standards.

While these two positions vary, this disagreement should have no impact on the project's compliance with the Alameda County Noise Ordinance. As seen in **Noise: Table 6** (above), if the project is mitigated as proposed by staff in proposed Condition of Certification **NOISE-6**, both the project's noise contribution and the cumulative (project plus ambient) noise level would comply with the 45 dBA limit of the Ordinance, measured at any residence.

CUMULATIVE IMPACTS

Section 15130 of the *CEQA Guidelines* (Cal. Code Regs., tit. 14) requires a discussion of cumulative environmental impacts. Cumulative impacts are two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts. The *CEQA Guidelines* require that the discussion reflect the severity of the impacts and the likelihood of their occurrence, but need not provide as much detail as the discussion of the impacts attributable to the project alone.

Pursuant to CEQA, a cumulative impacts analysis can be performed by either 1) summarizing growth projections in an adopted general plan or in a prior certified environmental document, or 2) compiling a list of past, present, and probable future projects producing related or cumulative impacts. The second method has been utilized for the purposes of this Staff Assessment.

The AFC identified no planned projects that could contribute to cumulative noise impacts in the project study area (EAEC 2001a, AFC § 8.4). Two energy-producing facilities (the Tesla Power Project and the Tracy Peaker Project) are proposed for the general area of the project, but are located at too great a distance to have a measurable effect on project noise levels. Traffic, agricultural and industrial noise sources are

present in the vicinity of the project site that could contribute to the cumulative noise levels at sensitive receptors. The effects of noise produced by those sources have been accounted for in part by the ambient noise level measurements, and the resulting noise levels are described in the noise level predictions listed above.

Increases in area traffic due to development of the Mountain House project will result in increases in background noise levels in the general area. Traffic noise level increases near the project site will depend primarily upon changes in traffic patterns in the immediate vicinity of the project. In general, it is expected that background noise levels will increase with increasing area development, which will contribute to the project noise levels.

ENVIRONMENTAL JUSTICE

Staff has reviewed Census 2000 information that shows the minority population is less than fifty percent within a six-mile radius of the proposed EAEC (please refer to **Socioeconomics Figure 1** in this Staff Analysis), and Census 1990 information that shows the minority/low income population is less than fifty percent within the same radius. However, there is a pocket of minority persons within six miles that staff has considered for impacts. Based on the noise analysis, staff has identified a potentially significant direct impact resulting from the operation of the project, but with the mitigation proposed in the Conditions of Certification, this impact would be reduced to less than significant. Therefore, there would be no potential disparate impact on the minority population, and there are no noise environmental justice issues related to this project.

FACILITY CLOSURE

In the future, upon closure of the EAEC, all operational noise from the entire EAEC site would cease, and no further adverse noise impacts from operation of the EAEC would be possible. The remaining potential temporary noise source is the dismantling of the structures and equipment, and any site restoration work that may be performed. Since this noise would be similar to that caused by the original construction of the EAEC, it can be treated similarly. That is, noisy work can be performed during daytime hours, with machinery and equipment properly equipped with mufflers. Any noise LORS that are in existence at that time would apply; applicable Conditions of Certification included in the Energy Commission Decision would also apply unless modified.

RESPONSE TO PUBLIC AND AGENCY COMMENTS

PUBLIC COMMENTS

Gary & Dolores Kuhn

G&DK 3: *The commentor noted that, on a visit to the Los Medanos Power Plant, the noise level was not "quiet as a library," as was indicated by the applicant in a public meeting.*

Response: The AFC and this Staff Assessment describe the predicted EAEC noise levels in a quantitative manner. Energy Commission staff notes that the noise produced by the Los Medanos Power Plant is not necessarily representative of the noise expected from the EAEC, as this project will be required to satisfy noise standards that are specific to the power plant configuration, and to its location relative to the nearest receptors. The recommended exterior noise standard will ensure that the power plant noise levels inside the most affected homes will be very low, and well within acceptable limits.

G&DK 18: *The commentor noted that noise from other power plants was not "quiet as a library," as was indicated by the applicant in a public meeting.*

Response: See the response above.

AGENCY COMMENTS

The County of Alameda commented on staff's interpretation of the Alameda County Noise Ordinance. See "LORS COMPLIANCE," above, for a discussion of this comment.

CONCLUSIONS AND RECOMMENDATIONS

Energy Commission staff concludes that the EAEC, including staff's recommended mitigation, will be built and operated to comply with all applicable noise laws, ordinances, regulations, and standards. Energy Commission staff further concludes that if the EAEC facility were designed as described above, and further mitigated as described below in the proposed Conditions of Certification, it is not expected to produce significant adverse noise impacts. To ensure compliance with all applicable noise LORS, Energy Commission staff recommends adoption of the following Conditions of Certification.

PROPOSED CONDITIONS OF CERTIFICATION

NOISE-1 At least 15 days prior to the start of ground disturbance, the project owner shall notify all residents within one-half mile of the site and the linear facilities, by mail or other effective means, of the commencement of project construction. At the same time, the project owner shall establish a telephone number for use by the public to report any undesirable noise conditions associated with the construction and operation of the project. If the telephone is not staffed 24 hours per day, the project owner shall include an automatic answering feature, with date and time stamp recording, to answer calls when the phone is unattended. This telephone number shall be posted at the project site during construction in a manner visible to passersby. This telephone number shall be maintained until the project has been operational for at least one year.

Verification: The project owner shall transmit to the CPM in the first Monthly Construction Report following the start of ground disturbance, a statement, signed by

the project manager, stating that the above notification has been performed, and describing the method of that notification, verifying that the telephone number has been established and posted at the site, and giving that telephone number.

NOISE-2 Throughout the construction and operation of the project, the project owner shall document, investigate, evaluate, and attempt to resolve all project related noise complaints.

The project owner or authorized agent shall:

Use the Noise Complaint Resolution Form (see Exhibit 1), or functionally equivalent procedure acceptable to the CPM, to document and respond to each noise complaint;

Attempt to contact the person(s) making the noise complaint within 24 hours;

Conduct an investigation to determine the source of noise related to the complaint;

If the noise is project related, take all feasible measures to reduce the noise at its source; and

Submit a report documenting the complaint and the actions taken. The report shall include: a complaint summary, including final results of noise reduction efforts; and, if obtainable, a signed statement by the complainant stating that the noise problem is resolved to the complainant's satisfaction.

Verification: Within 5 days of receiving a noise complaint, the project owner shall file a copy of the Noise Complaint Resolution Form, or similar instrument approved by the CPM, with the Alameda County Planning Department, and with the CPM, documenting the resolution of the complaint. If mitigation is required to resolve a complaint, and the complaint is not resolved within a 3-day period, the project owner shall submit an updated Noise Complaint Resolution Form when the mitigation is finally implemented.

NOISE-3 The project owner shall submit to the CPM for review and approval a construction noise control program, consistent with Cal-OSHA regulations (Title 8, Group 15, Article 105, Section 5096). The noise control program shall be used to reduce employee exposure to high noise levels during construction and also to comply with applicable OSHA and Cal-OSHA standards.

Verification: At least 30 days prior to the start of ground disturbance, the project owner shall submit to the CPM the above referenced program. The project owner shall make the program available to OSHA upon request.

NOISE-4 If a traditional, high-pressure steam blow process is employed, the project owner shall equip steam blow piping with a temporary silencer that quiets the noise of steam blows to no greater than 55 dBA measured at the nearest sensitive receptor. The project owner shall conduct steam blows only during the hours of 7 a.m. to 7 p.m. on weekdays, unless the CPM agrees to longer hours based on a demonstration by the project owner that offsite noise impacts will not cause annoyance.

If a low-pressure continuous steam blow or air blow process is employed, the project owner shall submit a description of this process, with expected noise

levels and projected hours of execution, to the CPM, who shall review the proposal with the objective of ensuring that the resulting noise levels will not exceed 45 dBA L_{eq}. If the low-pressure process is approved by the CPM, the project owner shall implement it in accordance with the requirements of the CPM.

Verification: At least 15 days prior to the first high-pressure steam blow, the project owner shall submit to the CPM drawings or other information describing the temporary steam blow silencer and the noise levels expected, and a description of the steam blow schedule.

At least 15 days prior to any low-pressure continuous steam blow, the project owner shall submit to the CPM drawings or other information describing the process, including the noise levels expected and the projected time schedule for execution of the process.

NOISE-5 Prior to the first steam or air blow(s), the project owner shall notify all residents within one mile of the site of the planned activity, and shall make the notification available to other area residents in an appropriate manner. The notification may be in the form of letters to the area residences, telephone calls, fliers or other effective means. The notification shall include a description of the purpose and nature of the steam or air blow(s), the proposed schedule, the expected sound levels, and the explanation that it is a one-time operation and not a part of normal plant operations.

Verification: The project owner shall notify residents and business owners at least 15 days prior to the first high-pressure steam blow(s). Within five (5) days of notifying these entities, the project owner shall send a letter to the CPM confirming that they have been notified of the planned steam blow activities, including a description of the method(s) of that notification.

NOISE-6 The project design and implementation shall include appropriate noise mitigation measures adequate to ensure that the noise level produced by operation of the project will not exceed an hourly average exterior noise level of more than 39 dBA L_{eq} measured at any residence.

No new pure tone components may be introduced. No single piece of equipment shall be allowed to stand out as a source of noise that draws legitimate complaints, as determined by the CPM. Steam relief valves shall be adequately muffled to preclude noise that draws legitimate complaints, as determined by the CPM.

Verification: Within 30 days of the project first achieving a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct a 25-hour community noise survey at Site 2. In addition, the applicant shall conduct short-term survey noise measurements at monitoring sites 3 and 4. The short-term noise measurements shall be conducted during both daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) periods. The noise surveys shall also include short-term measurement of one-third octave band sound pressure levels at each of the above locations to ensure that no new pure-tone noise components have been introduced.

If the results from the operational noise survey indicate that the noise level due to the plant operations exceeds 39 dBA for any given hour, mitigation measures shall be implemented to reduce noise to a level of compliance with this limit.

If the results from the operational noise survey indicate that pure tones are present, mitigation measures shall be implemented to eliminate the pure tones.

Within 15 days after completing the post-construction survey, the project owner shall submit a summary report of the survey to the Alameda County Planning Department, and to the CPM. Included in the survey report will be a description of any additional mitigation measures necessary to achieve compliance with the above listed noise limits, and a schedule, subject to CPM approval, for implementing these measures. Within 15 days of completion of installation of these measures, the project owner shall submit to the CPM a summary report of a new noise survey, performed as described above and showing compliance with this condition.

NOISE-7 Following the project first achieving a sustained output of 80 percent or greater of rated capacity, the project owner shall conduct an occupational noise survey to identify the noise hazardous areas in the facility. The survey shall be conducted by a qualified person in accordance with the provisions of Title 8, California Code of Regulations, sections 5095-5099 (Article 105) and Title 29, Code of Federal Regulations, section 1910.95. The survey results shall be used to determine the magnitude of employee noise exposure.

The project owner shall prepare a report of the survey results and, if necessary, identify proposed mitigation measures that will be employed to comply with the applicable California and federal regulations.

Verification: Within 30 days after completing the survey, the project owner shall submit the noise survey report to the CPM. The project owner shall make the report available to OSHA and Cal-OSHA upon request.

NOISE-8 Heavy equipment operation, pile driving, and noisy construction or demolition work shall be restricted to the times of day delineated below:

Weekdays	7 a.m. to 7 p.m.
Weekends and Holidays	8 a.m. to 5 p.m.

Haul trucks and other engine-powered equipment shall be equipped with adequate mufflers. Haul trucks shall be operated in accordance with posted speed limits. Truck engine exhaust brake use shall be limited to emergencies.

Horizontal drill rigs may be operated on a continuous basis, provided that the rigs are fitted with adequate mufflers and engine enclosures, and that the rigs are shielded from view of residences by berms, canal banks or other suitable barriers. If no such shielding is provided, horizontal drill rig operation shall be limited to the hours stated above.

Verification: The project owner shall transmit to the CPM in the first Monthly Construction Report a statement acknowledging that the above restrictions will be observed throughout the construction of the project.

NOISE-9 The Project owner shall remove from residential use, for the life of the project, that dwelling on Kelso Road, southeast of the project site, known as the Franco residence.

Verification: Prior to commercial operation, the project owner shall submit to the CPM copies of legal documents demonstrating that the project owner has control of the Franco residence, along with an affidavit, signed by the project owner, attesting that said residence is no longer used as a residence. The project owner shall submit a renewed affidavit to this effect annually in the Annual Compliance Report.

EXHIBIT 1 –
NOISE COMPLAINT RESOLUTION FORM

East Altamont Energy Center
(01-AFC-4)

NOISE COMPLAINT LOG NUMBER _____

Complainant's name and address:

Phone number: _____

Date complaint received: _____
Time complaint received: _____

Nature of noise complaint:

Definition of problem after investigation by plant personnel:

Date complainant first contacted: _____

Initial noise levels at 3 feet from noise source _____ dBA Date: _____
Initial noise levels at complainant's property: _____ dBA Date: _____

Final noise levels at 3 feet from noise source: _____ dBA Date: _____
Final noise levels at complainant's property: _____ dBA Date: _____

Description of corrective measures taken:

Complainant's signature: _____ Date: _____

Approximate installed cost of corrective measures: $ _____
Date installation completed: _____
Date first letter sent to complainant: _____ (copy attached)
Date final letter sent to complainant: _____(copy attached)

This information is certified to be correct:

Plant Manager's Signature: _____

(Attach additional pages and supporting documentation, as required).

REFERENCES

County of Alameda. 1994. Noise Element of the Alameda County General Plan.

County of Alameda. 1995. East County Area Plan.

County of Alameda. 1988. Chapter 6.60 (Noise) Alameda County General Ordinance Code.

County of Contra Costa. 1996. Noise Element of the Contra Costa County General Plan.

County of San Joaquin. 1999. Section 9-1025.9 (Noise) San Joaquin County Code.

EAEC (East Altamont Energy Center LLC) 2001. Application for Certification, East Altamont Energy Center Project (01-AFC-4). Submitted to the California Energy Commission on March 20, 2001.

EAEC (East Altamont Energy Center LLC) 2001a. Response Set #2 to Energy Commission Data Requests, dated August 17, 2001.

EAEC (East Altamont Energy Center LLC) 2001b. Response Set #3 to Energy Commission Data Requests, dated October 9, 2001.

EAEC (East Altamont Energy Center LLC) 2002a. Revised Noise Receptor Data, dated August 1, 2002.

EAEC (East Altamont Energy Center LLC) 2002ppp. Data Response Set 2 (Revised) to Energy Commission Data Requests, dated August 30, 2002 and docketed September 3, 2002.

Federal Transit Administration. 1995. *Transit Noise and Vibration Impact Assessment*. DOT-T-95-16. Harris, Miller, Miller and Hanson, Inc. Burlington, Massachusetts.

Gottlob, Dieter. 1995. "Regulations for Community Noise," Noise/News International, December 1995.

State of California. 1990. General Plan Guidelines, Office of Planning and Research, June 1990.

State of California. 1977. Model Community Noise Control Ordinance, Office of Noise Control, April 1977.

Noise: APPENDIX A
FUNDAMENTAL CONCEPTS OF COMMUNITY NOISE

To describe noise environments and to assess impacts on noise sensitive area, a frequency weighting measure, which simulates human perception, is customarily used. It has been found that A-weighting of sound intensities best reflects the human ear's reduced sensitivity to low frequencies and correlates well with human perceptions of the annoying aspects of noise. The A-weighted decibel scale (dBA) is cited in most noise criteria. Decibels are logarithmic units that conveniently compare the wide range of sound intensities to which the human ear is sensitive. **Noise: Table A1** provides a description of technical terms related to noise.

Noise environments and consequences of human activities are usually well represented by an equivalent A-weighted sound level over a given time period (Leq), or by average day and night A-weighted sound levels with a nighttime weighting of 10 dBA (Ldn). Noise levels are generally considered low when ambient levels are below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. Outdoor day-night sound levels vary over 50 dBA depending on the specific type of land use. Typical Ldn values might be 35 dBA for a wilderness area, 50 dBA for a small town or wooded residential area, 65 to 75 dBA for a major metropolis downtown (e.g., San Francisco), and 80 to 85 dBA near a freeway or airport. Although people often accept the higher levels associated with very noisy urban residential and residential-commercial zones, they nevertheless are considered to be levels of noise adverse to public health.

Various environments can be characterized by noise levels that are generally considered acceptable or unacceptable. Lower levels are expected in rural or suburban areas than what would be expected for commercial or industrial zones. Nighttime ambient levels in urban environments are about seven decibels lower than the corresponding average daytime levels. The day-to-night difference in rural areas away from roads and other human activity can be considerably less. Areas with full-time human occupation that are subject to nighttime noise, which does not decrease relative to daytime levels, are often considered objectionable. Noise levels above 45 dBA at night can result in the onset of sleep interference effects (USEPA 1971). At 70 dBA, sleep interference effects become considerable.

In order to help the reader understand the concept of noise in decibels (dBA), **Noise: Table A2** has been provided to illustrate common noises and their associated sound levels, in dBA.

Noise: Table A1 Definition of Some Technical Terms Related to Noise	
Terms	**Definitions**
Decibel, dB	A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals (20 micronewtons per square meter).
Frequency, Hz	The number of complete pressure fluctuations per second above and below atmospheric pressure.
A-Weighted Sound Level, dBA	The sound pressure level in decibels as measured on a Sound Level Meter using the A-weighting filter network. The A-weighting filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this testimony are A-weighted.
L_{10}, L_{50}, & L_{90}	The A-weighted noise levels that are exceeded 10%, 50%, and 90% of the time, respectively, during the measurement period. L_{90} is generally taken as the background noise level.
Equivalent Noise Level, L_{eq}	The energy average A-weighted noise level during the Noise Level measurement period.
Community Noise Equivalent Level, CNEL	The average A-weighted noise level during a 24-hour day, obtained after addition of 4.8 decibels to levels in the evening from 7 p.m. to 10 p.m., and after addition of 10 decibels to sound levels in the night between 10 p.m. and 7 a.m.
Day-Night Level, L_{dn} or DNL	The Average A-weighted noise level during a 24-hour day, obtained after addition of 10 decibels to levels measured in the night between 10 p.m. and 7 a.m.
Ambient Noise Level	The composite of noise from all sources, near and far. The normal or existing level of environmental noise at a given location.
Intrusive Noise	That noise that intrudes over and above the existing ambient noise at a given location. The relative intrusiveness of a sound depends upon its amplitude, duration, frequency, and time of occurrence and tonal or informational content as well as the prevailing ambient noise level.
Pure Tone	A pure tone is defined by the Model Community Noise Control Ordinance as existing if the one-third octave band sound pressure level in the band with the tone exceeds the arithmetic average of the two contiguous bands by 5 decibels (dB) for center frequencies of 500 Hz and above, or by 8 dB for center frequencies between 160 Hz and 400 Hz, or by 15 dB for center frequencies less than or equal to 125 Hz.

Source: California Department of Health Services 1976, 1977.

Noise: Table A2 Typical Environmental and Industry Sound Levels			
Noise Source (at distance)	A-Weighted Sound Level in Decibels (dBA)	Noise Environment	Subjective Impression
Civil Defense Siren (100')	140-130		Pain Threshold
Jet Takeoff (200')	120		Very Loud
Very Loud Music	110	Rock Music Concert	
Pile Driver (50')	100		
Ambulance Siren (100')	90	Boiler Room	
Freight Cars (50')	85		
Pneumatic Drill (50')	80	Printing Press Kitchen with Garbage Disposal Running	Loud
Freeway (100')	70		Moderately Loud
Vacuum Cleaner (100')	60	Data Processing Center Department Store/Office	
Light Traffic (100')	50	Private Business Office	
Large Transformer (200')	40		Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing

Source: Peterson and Gross 1974

SUBJECTIVE RESPONSE TO NOISE

The adverse effects of noise on people can be classified into three general categories:

Subjective effects of annoyance, nuisance, dissatisfaction.

Interference with activities such as speech, sleep, and learning.

Physiological effects such as anxiety or hearing loss.

The sound levels associated with environmental noise, in almost every case, produce effects only in the first two categories. Workers in industrial plants can experience noise effects in the last category. There is no completely satisfactory way to measure the subjective effects of noise, or of the corresponding reactions of annoyance and dissatisfaction, primarily because of the wide variation in individual tolerance of noise.

One way to determine a person's subjective reaction to a new noise is to compare the level of the existing (background) noise, to which one has become accustomed, with the level of the new noise. In general, the more the level or the tonal variations of a new noise exceed the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual.

With regard to increases in A-weighted noise levels, knowledge of the following relationships (Kryter 1970) can be helpful in understanding the significance of human exposure to noise.

1. Except under special conditions, a change in sound level of one dB cannot be perceived.
2. Outside of the laboratory, a three dB change is considered a barely noticeable difference.
3. A change in level of at least five dB is required before any noticeable change in community response would be expected.
4. A ten dB change is subjectively heard as an approximate doubling in loudness and almost always causes an adverse community response.

Combination of Sound Levels

People perceive both the level and frequency of sound in a non-linear way. A doubling of sound energy (for instance, from two identical automobiles passing simultaneously) creates a three dB increase (i.e., the resultant sound level is the sound level from a single passing automobile plus three dB). The rules for decibel addition used in community noise prediction are:

Noise: **Table A3**
Addition of Decibel Values

When two decibel values differ by:	Add the following amount to the larger value
0 to 1 dB	3 dB
2 to 3 dB	2 dB
4 to 9 dB	1 dB
10 dB or more	0
Figures in this table are accurate to ± 1 dB.	

Source: Thumann, Table 2.3

Sound and Distance

Doubling the distance from a noise source reduces the sound pressure level by six dB.

Increasing the distance from a noise source ten times reduces the sound pressure level by 20 dB.

Worker Protection

OSHA noise regulations are designed to protect workers against the effects of noise exposure, and list permissible noise level exposure as a function of the amount of time to which the worker is exposed:

Noise: **Table A4**
OSHA Worker Noise Exposure Standards

Duration of Noise (Hrs/day)	A-Weighted Noise Level (dBA)
8.0	90
6.0	92
4.0	95
3.0	97
2.0	100
1.5	102
1.0	105
0.5	110
0.25	115

Source: 29 CFR § 1910.95